

Patent Claims

1. Method for magneto-inductive determination of flow rate of a medium
5 flowing through a measuring tube (2) in the direction of the measuring tube
axis, wherein a magnetic field passes through the measuring tube (2)
essentially perpendicularly to the measuring tube axis, wherein a
measurement voltage is induced in at least one measuring electrode (3, 4)
arranged essentially perpendicularly to the axis of the measuring tube, and
10 wherein the induced measurement voltage delivers information concerning
the volume flow of the medium in the measuring tube (2),

characterized in that:

A test pulse (U_p) of a defined pulse length (t_p) is issued to the measuring
electrode (3, 4);

15 at least one signal in response to the test pulse (U_p) is determined at at
least two measuring points in time (t_1, t_2);

the measuring points in time (t_1, t_2) lie in a time window ($t_{\text{end}} - t_{\text{begin}}$), which
is so selected that no predictable disturbance signals occur on the
measuring electrode (3, 4) in this time window ($t_{\text{end}} - t_{\text{begin}}$);

20 the relaxation time (τ), or the length of time until the reaching of a
predetermined state of discharge (U_i), of the measuring electrode (3, 4) is
determined on the basis of the response signal determined in the
measuring points in time (t_1, t_2); and

a malfunctioning of the measuring electrode (3, 4) is detected, or becomes
25 detectable, on the basis of the determined relaxation time, or on the basis
of the length of time until the reaching of the defined state of discharge (U_i),
of the measuring electrode (3, 4).

30 2. Method as claimed in claim 1,
characterized in that

the relaxation time, or the length of time until the reaching of the defined
state of discharge (U_i), of the measuring electrode (3, 4) is determined in a

starting state, which is defined on the basis that there is no malfunction present on the measuring electrode (3, 4) due to accretions, and the determined relaxation time (τ), or the length of time until the reaching of the defined state of discharge (U_i), of the measuring electrode (3, 4) is stored as desired value.

3. Method as claimed in claim 1 or 2, characterized in that the test pulse (U_p) is applied to the measuring electrode (3, 4) with a predetermined, or predeterminable, pulse length (t_p) and/or with a predetermined, or predeterminable, pulse repetition frequency.

4. Method as claimed in claim 3, characterized in that the pulse length (t_p) of the test pulse (U_p) and/or the pulse repetition frequency of the test pulses is predetermined, or determined, as a function of conditions at the measuring location, especially as a function of the medium to be measured.

5. Method as claimed in claim 1 or 2, characterized in that whether the measuring electrode (3, 4) is working correctly, or whether a malfunctioning of the measuring electrode (3, 4) is present, is determined on the basis of a time change of the relaxation time (τ), or on the basis of the length of time until the reaching of the defined state of discharge (U_i), of the measuring electrode (3, 4).

6. Method as claimed in claim 2 or 5, characterized in that a malfunctioning or an indication of a coming malfunctioning is displayed and/or issued, when the time change of the relaxation time, or the change of the length of time until the reaching of the defined state of discharge (U_i), of the measuring electrode (3, 4) lies outside of a tolerance range around the desired value or when the relaxation time (τ), or the length of time until

the reaching of the defined state of discharge (U_i), of the measuring electrode (3, 4) changes tendentially.

7. Method as claimed in claim 1,
5 characterized in that
the time window ($t_{\text{end}} - t_{\text{begin}}$) is so selected that it lies after the point in time at which the test pulse (U_p) was applied to the measuring electrode (3, 4) to be examined and that it lies before the point in time at which the magnetic field on the measuring electrode (3, 4) to be examined is switched.
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8. Method as claimed in one or more of the preceding claims,
characterized in that
for the case in which the malfunctioning occurs as a result of the formation of a conductive coating (11, 11) on the measuring electrode (3, 4), an
15 automatic cleaning of the measuring electrode (3, 4) is activated, as soon as an indication of malfunction is displayed and/or issued.
9. Method as claimed in one or more of the claims 1 to 7,
characterized in that
20 for the case in which the malfunctioning occurs as a result of the formation of a conductive or non-conductive coating (11, 12) on the measuring electrode (3, 4), a display and/or an output occurs, indicating that the measuring electrode (3, 4) needs to be cleaned.
- 25 10. Method as claimed in claim 8 or 9,
characterized in that
the automatic cleaning of the measuring electrode is done by means of a direct or alternating current.
- 30 11. Apparatus for measuring flow of a medium flowing through a measuring tube (2) in the direction of the measuring tube axis, comprising: A magnet arrangement, which produces a magnetic field passing through the measuring tube (2) and extending essentially transversely to the measuring tube axis; a measuring electrode arrangement, which delivers a measured

value depending on the flow velocity of the medium through the measuring tube (2); and a control/evaluation unit (7), which determines the flow rate of the medium in the measuring tube (2) on the basis of the measured value; characterized in that

- 5 the control/evaluation unit determines at least one signal in response to the test pulse (U_p) at at least two measuring points in time (t_1 , t_2) lying in a defined time window ($t_{\text{end}} - t_{\text{begin}}$),
the time window ($t_{\text{end}} - t_{\text{begin}}$) is selected such that no predictable disturbance signals occur on the measuring electrode in this time window
10 ($t_{\text{end}} - t_{\text{begin}}$), and
the control/evaluation unit (7) determines the relaxation time (τ), or the length of time until the reaching of a defined state of discharge (U_i), of the measuring electrode (3, 4) on the basis of the response signal measured at the predetermined measuring points in time (t_1 , t_2).

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12. Apparatus as claimed in claim 9,

characterized in that

the test pulse is a rectangular pulse (U_p).